

PATRIOT IDSS PROGRAM TECHNOLOGY AT REDSTONE ARSENAL SUPPORTS OPERATION IRAQI FREEDOM

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Introduction

As far back as 1993, DOD had a vision that handling tough diagnostic jobs would entail the use of experts who may be on the other side of the world from the weapon system being diagnosed. In February 1993, a Memorandum of Agreement was signed between the Program Executive Office, Air and Missile Defense (PEO, AMD) and the Office of the Secretary of Defense to use Patriot as a test bed for what was to become the Integrated Diagnostics Support Demonstration (IDSD) Program. The IDSD Program, which integrated commercial off-the-shelf (COTS) and government off-the-shelf (GOTS) technology, was tested over a 3-year period using tactical Patriot systems in both CONUS and OCONUS. Drawing on high-technology experience from Patriot, other systems, and the commercial world, IDSD integrated satellite communications; expert system technology; remotely controlled test, measurement, and diagnostic equipment (TMDE); electronic publications; digital video; and computerized data acquisition. Upon successful completion in 1996, the IDSD Program transitioned to what is now known as the Integrated Diagnostics Support System (IDSS). Between 1996 and 1998, IDSS was to undergo another series of unit tests that really emphasized the technology from the soldier's point of view. From the beginning of the IDSD/IDSS Program, acceptance of the concept of improving maintenance through technology steadily grew. The evaluation of IDSS demonstrated that integrating the basic building blocks of personal com-

puters, test equipment, and communications provided a framework for effective system support and low-cost growth of additional capabilities.

Results of the IDSS evaluation indicated that the goals for maintenance enhancement could be attained, and that soldiers were very enthusiastic about using these new tools and technology. Access to up-to-date information was found to be instrumental in returning a weapon system to an operational status. Computers, normally used to assist in troubleshooting and analyzing data, were also found to potentially reduce errors and speed up procedures.

IDSS Initial Fielding

Initial fielding of IDSS technologies to the Ordnance Missile and Munitions Center and School (OMMCS) Training Detachment was conducted Oct. 26 to Nov. 5, 1999, at Fort Bliss, TX. The Patriot Project Office, now a part of the Lower Tier Project Office (LTPO), had received final approval from the OMMCS Commandant on Oct. 20, 1999, which set the stage for fielding to the training detachment.

The fielding effort at Fort Bliss began with the installation of sound cards and Institute of Electronic and Electrical Engineers 488.2 Instrument Interface cards on seven Patriot Automated Logistics System (PALS) AN/PSM-80 (V) 1 computers. These cards provide audio and instrumentation support for the various IDSS functions. Upgraded hard drives with IDSS software enhancements were then installed. The new software included: Microsoft® Windows '95

Operating System; Interactive Authoring Display System-based Patriot Interactive Electronic Technical Manuals; Procomm by Quarterdeck to allow data file transfers using the Single Channel Ground and Airborne Radio System tactical radios; Symantec pcAnywhere for file application sharing and remote access and control; and Microsoft NetMeeting to facilitate voice communications among nodes on the new Patriot local area network (LAN).

During the second week of the process, personnel from OMMCS and Raytheon Training Systems received detailed training on the use of the IDSS system. IDSS field analysts began the session by giving students a detailed overview of IDSS Programs. They then taught each student how to set up the LAN and employ the IDSS system using the latest technology. Analysts then taught students the setup of the required modernized TMDE used in the performance of the Computer-Aided Procedures, which were developed by CAS Inc. specifically for the IDSS Program. They also demonstrated the capability to remotely control the test equipment and monitor troubleshooting efforts from locations external to the unit.

In early 2000, the LTPO decided to upgrade the older computers to new Dell™ 7500 laptops. Procurement action was initiated, and the new Dell laptops were obtained as replacements for the PALS computers. This was a major upgrade for the soldier in the field because the Dell laptops had newer operating systems, more memory, and larger hard drives.

Expanding And Applying IDSS Technology

During Operation Desert Storm, the limited data registered by nontactical portable data recorders and other prototype equipment in the Patriot systems had to be sent to the United States for analysis via courier service or shipped via Federal Express. This method of sending data for analysis took anywhere from 2-14 days depending on the method used. Problems also existed because of more stringent import and export controls. It became apparent early that a method was needed to expedite the transfer of data from remote locations anywhere in the world back to the analysts in the United States. IDSS support personnel from CAS Inc. asked their system engineers for assistance with this issue. Using IDSS technology, system engineers designed a secure satellite communications system capable of transferring the data from remote locations to CAS Inc. servers. Once this was in place, the data-reduction analysts were able to download the necessary data from the servers at the Air and Missile Defense Data Analysis Network (AMDAN) facility. This new methodology provides the capability for sending data, voice, and video in a secure mode to the central AMDAN facility.

Not only does this technology provide the logistical data needed, it also provides a wealth of operational information for the analyst. The Embedded Data Recorder (EDR) provides information such as whether a particular engagement was successful or, if not, why. If anomalies exist, the data-reduction analyst will be able to detect them, and system engineers can recommend corrective measures. This corrective action may be either improving software for a particular item within the system or supporting the issuance of a field bulletin to the units in the field.

When available, the EDRs enable evaluation to determine specific aspects of functional areas of hardware and software as well as overall system effectiveness. Without this data, critics could argue, as they did after Desert Storm, that Patriot was not effective. However, the greatest benefit of recorded data is in the investigation of anomalous events. Recorded data can be quickly distributed to analysts at Raytheon; Lockheed Martin; CAS Inc;

the research, development and engineering center; the LTPO; and other contractors to quickly isolate causes of phenomena that may be a result of weather, atmospheric conditions, hardware faults, software problems, or operational procedures. This can lead to responsive changes that protect the force and enable warfighters to be more effective.

Without recorded data, analysts must speculate about observed problems and, in many cases, it becomes impossible to reproduce the anomaly or discover its cause. The net effect can be delays in adjusting to battlefield conditions, delays in correcting residual problems, and reduced combat effectiveness.

The commander and the soldiers are critical links in the potential benefits that can result from recorded data. The commander must emphasize its importance, and the soldiers must activate the recording of data and maintain the data recorders.

Supporting OIF

To date, EDRs from Operation Iraqi Freedom (OIF) have been invaluable in assessing Patriot performance and evaluating anomalous events. The lack of recorded data has in some cases impacted ability to be as responsive as desired to some field reports. The EDRs are not considered mission-critical items. The troops can fight without data recording. However, the recorded data and the insight it provides on system performance could be critical to fighting effectively and surviving to fight tomorrow's battle.

This new technology provides literally a foxhole-to-factory means of obtaining data in a timely manner and then being able to use such data as necessary for the support of our soldiers in the field.

Conclusion

The IDSS Program has truly been a team effort. Patriot's prime contractor, Raytheon, is responsible for the remote maintenance monitor and getting IDSS technology to the field. CAS Inc., Patriot's System Engineering and Technical Assistance contractor, has played a major role in IDSS assisting with the design and development of LANs, computer-aided procedures for performing remotely controlled TMDE processes, and secure satellite communications.

At the U.S. Army Aviation and Missile Command Integrated Materiel Management Center, the Electronics Publications Division manages specialized publication needs. The logistics laboratory has been responsible for developing the video systems. Military users have played an active role in the definition of the system itself and how it should be used. Representatives of the allied nations using Patriot have been an integral part of joint efforts to guide the overall development of IDSS.

While there are challenges associated with integrating COTS and GOTS components, today's environment of funding constraints and streamlined acquisition dictates tailoring the use of commercial products and other integration of technologies as a mainstream approach to contain both cost and risk. Challenges will always exist to provide the soldier with tools, technology, and interfaces that are intuitive while simultaneously imposing minimum impact to the existing support infrastructure. IDSS is meeting this challenge.

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